

Appl. No. 10/810,013  
Amdt. dated January 11, 2007  
Reply to Office action of July 11, 2006

### **Remarks/Arguments**

#### **Amendments.**

The applicant has amended claim 10, and all remaining claims by virtue dependency, to recite “A mesoporous metal carbonate structure formed of metal carbonate rods and having pores between about 1 nanometer and about 150 nanometers.” Support for this amendment is found at the specification at page 4, line 14 through 16, and in figures 1a, 1b and 1c. No new matter is added thereby.

#### **Restriction**

The examiner has indicated that the application contains claims directed to the following patently distinct species: alkaline earth metals (Be, Mg, Ca, Sr, Ba, Ra), transition metals (Ni, Ti, Zn), & alkali metals (Li). The examiner has further indicated that, pursuant to 35 USC 121, the applicant is required to elect a single disclose species for prosecution of the merits, to which claim shall be restricted if no generic claim is finally held to be allowable, and that currently, claimed 10 is generic. The applicant hereby elects Ca.

The examiner further recounts a telephone conversation with the undersigned on 6/20/06 in which the provisional election was made with traverse to prosecute the distinct species of alkaline earth metals (Be, Mg, Ca, Sr, Ba, Ra), corresponding to claims 10 through 12. Affirmation of the election is hereby made by the applicant.

#### **35 USC 102**

The examiner has rejected claims 10 through 12 is being anticipated by Mahuli et al. (AIChE 1997). The examiner states that Mahuli teaches a calcium carbonate with a significant portion of its pores in the 5-20 nm size range, citing the abstract. However, a careful review of Mahuli shows that the abstract in fact discloses a calcined  $\text{CaCO}_3$  sorbent with an open internal porosity having a pore volume in the 50 to 200 Å range. Further, in the abstract, Mahuli teaches that it is desirable to avoid the formation of

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Mahuli's calcined  $\text{CaCO}_3$  sorbent in the  $<50 \text{ \AA}$  range, because "this range represents an optimum pore size for solvation since it provides a reasonably high surface area and is less susceptible than  $<50 \text{ \AA}$  pore sizes to pore filling, or pore-mouth plugging due to the formation of higher molar volume  $\text{CaSO}_4$ ." Accordingly, the applicant's range of between 1 and 150  $\text{\AA}$  range falls outside of both the Mahuli range recited by the examiner, of 5-20 nm, and the range actually recited in the abstract, of between 50 to 200  $\text{\AA}$ . More important than this distinction, however, is the fact that the applicant's specific surface area is radically different than that taught by Mahuli.

The examiner's attention is drawn to figure 9 of the Mahuli reference on page 2328. There, as shown by Mahuli, the surface area of the formed carbonate materials begins at  $60 \text{ m}^2/\text{g}$ . As described in the text accompanying the figure, calcining Mahuli's carbonate materials generally causes the service area to decrease from that starting point. At a temperature of  $900^\circ \text{ C}$ , Mahuli does show a temporary increase in surface area up to about  $73 \text{ m}^2/\text{g}$ . However, after about 50 ms of residence time, even at  $900^\circ \text{ C}$  the Mahuli carbonate shows a decrease in surface area. Thus, the surface area of  $73 \text{ m}^2/\text{g}$  represents the maximum surface area taught by the Mahuli reference.

Examiner's attention is now drawn to page 4, line 18 through 19, where the applicant discloses a surface area of  $1774 \text{ m}^2/\text{g}$ . The applicant notes that this surface area is more than an order of magnitude greater than the maximum shown by Mahuli, times 2. The reason for this difference is because of the structural differences between the formed carbonates. In the present invention, as disclosed at page 4, line 13 through 18, the method of the present invention forms spicules constructed from dense calcium carbonate rods that arise from the structure of the bi-continuous phase template. These rods result from differences in the preparation methodology, and produce materials with vastly different specific surface areas. To ensure that these differences are adequately addressed in the claims, the applicant has amended the claim 10, and all remaining claims by virtue dependency, to recite that the mesoporous metal carbonate structures are formed of metal carbonate rods. While the structure was arguably inherent in the original claim, the applicant has made the distinction explicit, to ensure that the claim is readily

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distinguished from the Mahuli reference. Accordingly, as it is axiomatic that a proper rejection under 35 U.S.C. 102(e) must contain each and every limitation of the claim, (“[a]nticipation requires the disclosure in a single prior art reference of each element of the claim under consideration” W.L. Gore & Assocs. V. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983), the applicant respectfully requests that the examiner remove his rejection under 35 USC 102, as the limitation that the mesoporous metal carbonate structures are formed of metal carbonate rods is not found in the Mahuli reference, and the Mahuli reference in fact seeks to avoid the high surface areas inherent in structures formed of metal carbonate rods, such as those taught and claimed by the present invention.

The examiner has further rejected claims 10 through 12 is being anticipated by Morifuji (5,240,692). Examiner notes that Morifuji teaches a magnesium carbonate having pores in the nanoscale range, including many less than 10 nm, and references column 3. Accordingly, the examiner's attention is drawn to the abstract, column 2, lines 13 through 15, column 2, lines 46 and 47, and claims 1, 3, 4, 5, and 10, where the Morifuji reference consistently teaches specific surface areas between 10 and 70 m<sup>2</sup>/g, an order of magnitude smaller than that taught by the present invention. The examiner's attention is thus further drawn to column 2, lines 58 to 64 wherein Morifuji recites:

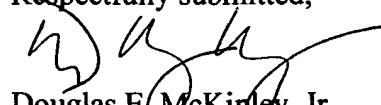
Also the specific surface area of the particles has serious influences on the fine pore volume. In the particles having a specific surface area exceeding the above-mentioned upper limit, plate crystals grow too much and therefore, the fine pore volume becomes extremely small.

Plainly, Morifuji seeks to avoid the high surface area inherent in the metal carbonate rod structure of the present invention. Accordingly, for the same reasons that the Mahuli reference does not form a prima facie case of anticipation under 35 USC 102, Morifuji also does not. The applicant therefore respectfully requests that the examiner remove his rejection under 35 USC 102

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Applicant has made an earnest attempt to place the above referenced application in condition for allowance and action toward that end is respectfully requested. Should the examiner have any further observations or comments, he is invited to contact the undersigned for resolution.

Respectfully submitted,



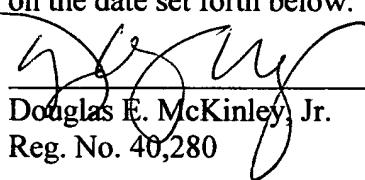
Douglas E. McKinley, Jr.  
Reg. No. 40,280

PO Box 202  
Richland, WA 99352  
Voice (509) 628-0809  
Fax (509) 628-2307

The undersigned hereby certifies that the forgoing Amendment dated January 11, 2007 in reply to the office action of July 11, 2006 (8 pages), together with a fee sheet and a return postcard are being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to

Mail Stop Non-Fee Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

on the date set forth below.



Douglas E. McKinley, Jr.  
Reg. No. 40,280

1/11/2007  
Date